

Astronomy: Earth and Space Systems

8-4 The student will demonstrate an understanding of the characteristics, structure, and predictable motions of celestial bodies. (Earth Science)

8.4.10 Compare the purposes of the tools and the technology that scientists use to study space (including various types of telescopes, satellites, space probes, and spectroscopes).

Taxonomy level: 2.6-B Understand Conceptual Knowledge

Previous/Future knowledge: This indicator is mostly new material for this grade. Only, the purpose of telescopes, in general, as a tool of astronomy is recognized in 4th grade (4-3.8).

It is essential for students to know that astronomers use telescopes, satellites, space probes, and spectroscopes to make observations and collect data about objects in the solar system and outside of the solar system. These tools and the associated technology that allow astronomers to analyze and interpret the data help scientists learn about the solar system and about the universe.

Telescopes

- Refracting and reflecting *optical telescopes* collect visible light, then use convex lenses or mirrors to focus the light producing larger, brighter images of distant objects in space.
- *Radio telescopes* receive radio waves emitted from objects in space, including waves from very distant stars and galaxies; it can receive information in any weather and during day or night.
- Other telescopes “read” infrared or x-ray signals but have to be placed where Earth’s atmosphere does not block or absorb the signals.

Satellites

- *Satellites* are placed in orbit around Earth with special instruments and telescopes that collect information from space which is sent back to Earth where it is interpreted.
- Data gathered from satellites are not hampered by Earth’s atmosphere.

Space probes

- *Space probes* contain instruments to collect data and travel out of Earth’s orbit to explore places that would be too dangerous for astronomers; the instruments that a probe contains depends upon the space mission.

Spectroscopes

- *Spectroscopes* collect the light from distant stars and separate that light into bands of different colors; by studying these bands, astronomers identify the elements in a star.

It is not essential for students to know how the light waves are refracted and reflected within each optical telescope. The names of specific telescopes, satellites, or space probe missions are not necessary.

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Assessment Guidelines:

The objective of this indicator is to *compare* the purposes of the tools and technology used to study space; therefore, the primary focus of assessment should be to detect similarities and differences between various types of telescopes, satellites, space probes, and spectroscopes.

However, appropriate assessments should also require students to *identify* a tool based on a given purpose; *compare* optical telescopes to a radio telescope; *illustrate* the uses of different tools and technology; or *recognize* the appropriate tool or technology required for a particular task.